

CS 365: Artificial Intelligence and Machine Learning

Lam Dang x Anh Dang

Report for Lab 1

I/ One Prize Search Algorithm

Results of Breadth-First Search for:

-“1prize-open.txt”:

%%

%	%P	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	%#####	%	
%	%%%%%%%%%#	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	#####	%#	%
%	%%%%%%%%%%#####	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	%#	%	
%	%#	%	

%%

+The cost is 45

+The number of Nodes Expanded is 1900

[illegible]

```
+The number of Nodes Expanded is 1265
```


Results of Depth-First Search for:

-“1prize-open.txt”:

%%%%%%%%%

% #####P#####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #####%

% #% #####%

% #% #####%

% #% #####%

% #% #####%

% #% #####%

% ##% #####%

%%%%%%%%%

+The cost is 357

+The number of Nodes Expanded is 1696

[illegible]

```
+The number of Nodes Expanded is 292
```

[illegible]

```
+The number of Nodes Expanded is 747
```

Results of Greedy Best-First Search for:

-“1prize-open.txt”:

%%%%%%%%%

%		%P		%
%		%#		%
%		%#		%
%		%#		%
%		%#####		%
%		%%%%%%%%%#		%
%		%#		%
%		%#		%
%		%#		%
%		%#		%
%	#####	%#		%
%	#%%%%%%%%#	#		%
%	#%	#	#	%
%	#%	#	#	%
%	#%	#	#	%
%	#%	#	#	%
%	#%	#	#	%
%	##%	#####		%

%%%%%%%%%

+The cost is 57

+The number of Nodes Expanded is 542

[illegible]

```
+The number of Nodes Expanded is 225
```


0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89										

```
+The number of Nodes Expanded is 633
```

Results of A* Search for:

-“1prize-open.txt”:

%%%%%%%%%

%		%P#####	%
%		% #	%
%		% #	%
%		% #	%
%		% #	%
%		%%%%%%%%#	%
%		%#	%
%		%#	%
%		%#	%
%		%#	%
%	#####	#####	%
%	%%%%%%%%	###	%
%	#%		%
%	#%		%
%	#%		%
%	#%		%
%	#%		%
%	##%		%

%%%%%%%%%

+The cost is 45

+The number of Nodes Expanded is 863

[illegible]

```
+The number of Nodes Expanded is 708
```

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89										

```
+The number of Nodes Expanded is 2476
```

II/ Multiple Prize Search Algorithm

Heuristic: Nearest-Neighbour Heuristic

For the multiple goal search algorithm, we chose the Nearest Neighbor Heuristic based on cost. The algorithm will compare the cost, based on the A* cost between 2 points in the maze which we think is optimal, to travel from prize to other unvisited prizes and choose the route to the new prize with the least cost. From the new prize, it will repeat the same procedure. After performing with all the prizes, we produce a route that start from the Start position and go through all the Nearest-Neighbor prizes based on cost. With the route between two pair of prizes is the shortest compare with other prizes, this can lead to an optimal route that produce the least cost

Result of MultiPrize AStar Search Algorithm:

-“multiprize-tiny.txt”:

```
%%%%%%%%%
%b  % 7  %
% %a% %% %
% %    6%8%
% 1%P%    %
%2  0  5  %
% %%% % %
%3 4    %9%
%%%%%%%%%
```

+The cost is 44

+The number of Nodes Expanded is 139

-“multiprize-small.txt”:

%%%%%%%%
% P 0% 4 5 %
% % % % % % % % % %
% %a % % % % % 6%
%b % 1 %3 % %
% % % % % 7%
%c 2 % % % %
% % % % % % % % % %
% % % % % % % % %
% % % % %8 %
%d% % % % % % % %
% % 9% e%
%%%%%%%%

+The cost is 165

+The number of Nodes Expanded is 824

-“multiprize-medium.txt”:

%%
% e % j % 2 % % 8 %
% % % % % % % % % % % %
% c % b % % % % % %
% d %9 % % 1 % % %
% % % % % % 3 % 4 % % %
%f % i % a % % % % % %
% % % % % % % 0 % % % 6 %
% % % % % P % % % % %
%g % % % % % 5 % %
% % % % % % % % % % %
% h % % % % 7 %
%%

+The cost is 240

+The number of Nodes Expanded is 1194